AUSTRALASIAN CERATOPOGONIDAE (DIPTERA, NEMATOCERA).

PART II. THE LEPTOCONOPS GROUP OF GENERA.

By David J. Lee, B.Sc.

(Plate xxi, 13 Text-figures.)

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In this part Australasian species of the genera *Leptoconops* (four species) and *Styloconops* (three species) are discussed, one species being described as new in each of the two genera.

Leptoconops Group.

Two genera from this group are known to occur in the Australasian region, namely *Leptoconops* and *Styloconops*. Records of the species are few, but they must be fairly widely distributed. Probably all bite man, but only the species from New Guinea and New Zealand appear to occur in large numbers and hence cause considerable annoyance. Information on the life histories of these insects, about which nothing is known in this region, should prove particularly interesting.

Genus Leptoconops Skuse (sens. lat.).

Skuse, F. A., 1889.—Proc. Linn. Soc. N.S.W., 4 (2nd series) : 288.
Carter, H. F., 1921.—*Bull. ent. Res.*. 12 : 5.

Synonymy: Macfie (1940) places the following in the synonymy of *Leptoconops*: *Tersethes* Towns. 1893; *Centrotypus* Grassi 1901; *Mycterotypus* Lutz 1912, nec Phil; *Schizoconops* K. 1918; *Protersethes* K. 1921.

Holoconops K. 1918 and *Microconops* K. 1921 are treated as separate genera but it seems desirable, for practical purposes, to follow Carter's (1921) system of classification in regarding these as merely subgenera.

Genotype: *Leptoconops stygius* Skuse loc. cit. (By monotypy.)

Subgenus Leptoconops (Skuse) Carter.

Carter, H. F., 1921.—*Bull. ent. Res.*. 12 : 10.

SUBGENERIC CHARACTERS.

(With the exception of the number of antennal segments these apply equally well to the other subgenera of *Leptoconops*, which are not, however, recorded from the Australasian region.) The eyes are widely separated, with the frons bare or with only one pair of bristles between the eyes. The mouthparts are less than or equal in length to the height of the head. The palpi are only four-segmented, with the first and second segments reduced, the third large and swollen and the fourth of approximately the same length as the third, but not swollen. The male palpi are somewhat longer and the third segment is not swollen. The female antennae comprise fourteen segments, the first being little more than a chitinous ring, the second (the pedicel) large and rounded, and the third rather intermediate in size between the second and the fourth and succeeding flagellar segments. Segments 4 to 13 are small, transverse or subspherical, and the terminal segment is considerably longer than the preceding one. The male antennae comprise fifteen segments with normal plumes on the flagellum and the terminal segment considerably lengthened.

The venation of the wings is rather indistinct. The costa does not extend to the middle of the wing and the branches of the radius are largely fused distally with the costa. Carter (1921, p. 8) and de Meillon (1936, p. 142) both consider the first

apparent vein extending from near the base of the wing to the apex as a spurious one; this does seem the only interpretation which will not be a direct negation of the interpretation adopted for all other Ceratopogonidae. The radio-median cross-vein is absent and M_2 may be interrupted at the base. Microtrichia are present over the wing surface but macrotrichia are absent.

The legs are moderately long, the posterior pair being the longest. The femora are unmodified and unarmed. There is a short, sharp ventral spur at the tip of each tibia, the first tarsal segment of the fore- and mid-legs is about twice the length of the second and in the hind legs about 1·5 times its length. The second to fourth tarsal segments are cylindrical, decreasing in length, but the fifth is nsually distinctly longer than the fourth. Some of the bristles of the first tarsal segments may be developed as spines, particularly the apical ones.

The female abdomen is terminated by two exceedingly long, narrow, tapering lamellae. In the male the hypopygium is large and conspicuous.

Key to Australasian Species of the Leptoconops Group.

1. Lamellae elongate, considerably longer than wide (Genus *Leptoconops*) 2
   Lamellae not longer than wide (Genus *Styloconops*) 5
2. Larger species. Wing length 2·0 mm. or more; length of antenna 0·62 mm. or more 3
   Smaller species. Wing length 1·6 mm. or less; length of antenna 0·52 mm. or less 4
3. Antenna very long, last segment at least six times as long as broad .. *L. longicornis* Cart.
   Antenna shorter, last segment at most 3·5 times as long as broad ..... *L. grandis* Cart.
4. Larger species; segment 3 of palpus 1·7 times segment 4; wing length 1·3-1·6 mm. ..... *L. stygius* Sk.
   Smaller species; segment 3 of palpus 1·3 times segment 4; wing length 1·1-1·2 mm. ..... *L. woodhilli* n. sp.
5. Frons covered with numerous strong, short spines ..... *S. australiensis* n. sp.
   Frons with sparse hairs only 6
6. First hind tarsus two-thirds length of tibia; distal half of femora not contrasting in colour with basal half ..... *S. myersi* (Tonn.)
   First hind tarsus one-half length of tibia; distal half of femora dark brown in strong contrast to lighter brown of basal half ..... *S. albiventris* (de Meij.)

Leptoconops (Leptoconops) stygius Skuse.

Skuse, F. A., 1889.—Proc. Linn. Soc. N.S.W., 4 (2nd series): 288.

Carter, H. F., 1921.—*Bull. ent. Res.*, 12: 10-11.

Type: Type ♀ in Macleay Museum, University of Sydney.

Type Locality: Woronora (near Sydney, New South Wales).

DISTINCTIVE CHARACTERS.

(See Plate xxi, fig. 3, for photograph of wing and Text-figs. 1–3 for drawings of head, palpus and terminal abdominal segments.)

L. stygius is an entirely dark species with hyaline wings. The eyes are widely separated, with only a pair of frontal bristles at the level of the top of the eyes. The antennae are short with the flagellar segments spherical, except 14, which is about 1·6 times as long as broad. The scutum is clothed with minute black hairs, the legs are without any obvious modifications and the claws are equal and simple (but with a bristle arising from the base of each). The lamellae of the abdomen are elongate, bluntly rounded distally and 0·22 the length of the wing. There are two spermathecae, both heavily chitinized, subspherical (30μ) with the commencement of the duct chitinized for a short distance.

The shape of the antennae, and in particular that of the terminal segment, will distinguish this species from *L. longicornis* and *L. grandis*, but only the measurements of various parts, snch as the palpi, the antennal segments and the wings, will distinguish it from *L. woodhilli*.

The male and the larva are both unknown.

Distribution: The type locality and Fitzroy Falls (A. Tonnoir, 22-27.xi.1937). Additional material in C.S.I.R. Museum.

Leptoconops (Leptoconops) woodhilli, n. sp.

Types: Holotype ♀ (mounted on slide) and four paratype ♀♀ in the C.S.I.R. Museum. Three paratype ♀♀ (one mounted on slide) in the Macleay Museum, University of Sydney.

Type Locality: Adelaide River, Northern Territory (A. R. Woodhill, i: 1943).

I have compared a series of seven specimens of *Leptoconops* from Adelaide River with a series of fourteen specimens of *L. stygius* from Fitzroy Falls and although there are no really obvious differences between the two, the measurements of various parts are so consistently at variance that I feel the Northern Territory representative of this genus should, for the present at least, be treated as distinct. The genus *Leptoconops* is very imperfectly known in Australia and the fact that no males or larvae of any species are as yet known makes it exceedingly difficult to arrive at a satisfactory interpretation of specific differences.

DISTINCTIVE CHARACTERS.

(See Plate xxi, fig. 2, for photograph of wing.) *L. woodhilli* is again a uniformly black species somewhat smaller than *L. stygius* (the difference in size is quite obvious to the naked eye in pinned specimens when the two species are compared). Structurally there are no differences between the two, but the measurements of almost all parts of *L. woodhilli* are smaller than those of *L. stygius* and in particular those of the wings, the antennae, the palpi and the hind legs. The relative lengths of the third and fourth segments of the palpi also do not correspond. A comparative table (Table 1) gives the details of the meaurements of *L. woodhilli* in relation to other species.

Distribution: As yet this species is only known from the type locality.

Leptoconops (Leptoconops) longicornis Carter.

Carter, H. F., 1921.—*Bull. ent. Res.*, 12: 11-12.

Types: Two cotype ♀♀ in the British Museum (Natural History).

Type Locality: Stated as the interior of Western Australia. The collector of these specimens, Professor W. J. Dakin, informs me that they were certainly not taken at any great distance from the coast and probably in the vicinity of Perth.

DISTINCTIVE CHARACTERS.

(See Plate xxi, fig. 4, for photograph of wing, and Text-figs. 4–6 for head, palpus and terminal segments of abdomen.)

This is a rather larger species than *L. stygius* and is particularly distinct on antennal characters. The length of the antennae is 0·84 mm. or almost twice that of *L. stygius*, the flagellar segments being subspherical to narrowly oval (1·0 to 2·1 times as long as broad) and the terminal segment is 6·5 times as long as broad, whereas in *L. stygius* it is less than twice as long as broad.

Neither the male nor the larva is known.

Distribution: I have examined a large series from Crawley, W.A. (D. Swan, 1.vii.1931), and a further series from Katanning, W.A. (M. M. H. Wallace, 9.v.1947, biting man freely at 3.30 p.m.). Additional material in the C.S.I.R. Museum.

Leptoconops (Leptoconops) grandis Carter.

Carter, H. F., 1921.—*Bull. ent. Res.*, 12: 12-13.

Types: Two ♀♀ cotypes in British Museum (Natural History).

Type Locality: Stated as interior of Western Australia but see remarks under *L. longicornis*.

DISTINCTIVE CHARACTERS.

According to Carter this species is almost identical with *L. longicornis* except in the form of the antenna. The length of this organ is 0·62 mm. (0·84 in *L. longicornis*), the individual segments of the flagellum (4–13) are subspherical, being from 1·0 to 1·1 times as long as broad and the terminal segment is almost 3·5 times as long as broad (6·5 in *L. longicornis*) and as long as the preceding 2½ segments (preceding 3 in *L. longicornis*).

The male and the larva are again unknown.

Distribution: I have not seen this species and there are no further records of its distribution in Western Australia.

Genus Styloconops Kieffer.

Kieffer, J. J., 1921.—*Arch. Inst. Past. de l'Afr. du Nord.*, 1 : 107.

Synonymy: *Acanthoconops* Carter, H. F., 1921. *Bull. ent. Res.*, 12 : 24.

Genotype: *Styloconops albiventris* (de Meijere). (By original designation.)

GENERIC CHARACTERS.

The genus *Styloconops* only differs from *Leptoconops* in having the area between the eyes (the frons) clothed with short spines and the lamellae very short, actually broader than long. As in *Leptoconops* (sens. str.) there are fourteen segments in the female antenna. The sensory area on the third segment of the palpus is a single large pit, whereas in at least the Australasian species of *Leptoconops* the sensory area consists of a group of numerous small pits.

Styloconops albiventris (de Meijere).

de Meijere, J. C. H., 1915.—*Tijdschr. v. Ent.*, 58 : 98 (*Leptoconops*).

Types: Location of types not stated.

Type Locality: Mouth of Sernowai River, New Guinea.

Synonymy: *Leptoconops spinosipes* Kieffer, J. J., 1917. *Ann. Mus. Nat. Hung.*, 15 : 190. (Type locality: Tamara, Berlinhafen, New Guinea.) *Acanthoconops albiventris* Carter, H. F., 1921. *Bull. ent. Res.*, 12 : 26.

DISTINCTIVE CHARACTERS.

(See Plate xxi, fig. 1, for photograph of wing, and Text-figs. 7–10 for head, palpus, fore tarsus and terminal segments of abdomen.)

An entirely dark species except for the abdomen, which is often white laterally in expanded unfed specimens. It may readily be distinguished from the species of *Leptoconops* by the small fine spines on the frons and the prominent spines on the legs. Reference to Table 1 and Text-figures 7–10 will further clarify its specific characters. Differentiation from *S. myersi* and *S. australiensis* is clarified under those species.

This is undoubtedly an extremely prevalent and annoying insect on the New Guinea coast.

Distribution: Apart from the type locality records Macfie (1939) has identified specimens of this species from Aitape (New Guinea) and Rabaul (New Britain) and from the Marquesas (1933). I have examined a large series of female specimens also from Aitape and Finschhafen (both M. H. Wallace), Busama, 12.v.1947 (A. J. Bearup), and Gona, 12.xi.44 (H. A. Grandall). Additional material in both Macleay Museum, Sydney University, and C.S.I.R. Museum, Canberra, A.C.T.

Styloconops myersi (Tonnoir).

Tonnoir, A. L., 1923.—*Bull. ent. Res.*, 14 : 443 (*Acanthoconops*).

Type: Holotype ♀ in Cawthron Institute, Nelson, New Zealand. Several paratypes in School of Public Health and Tropical Medicine, Sydney, one paratype in C.S.I.R. Museum, Canberra, A.C.T.

Type Locality: Taputaputa, Spirit Bay, North Island, New Zealand.

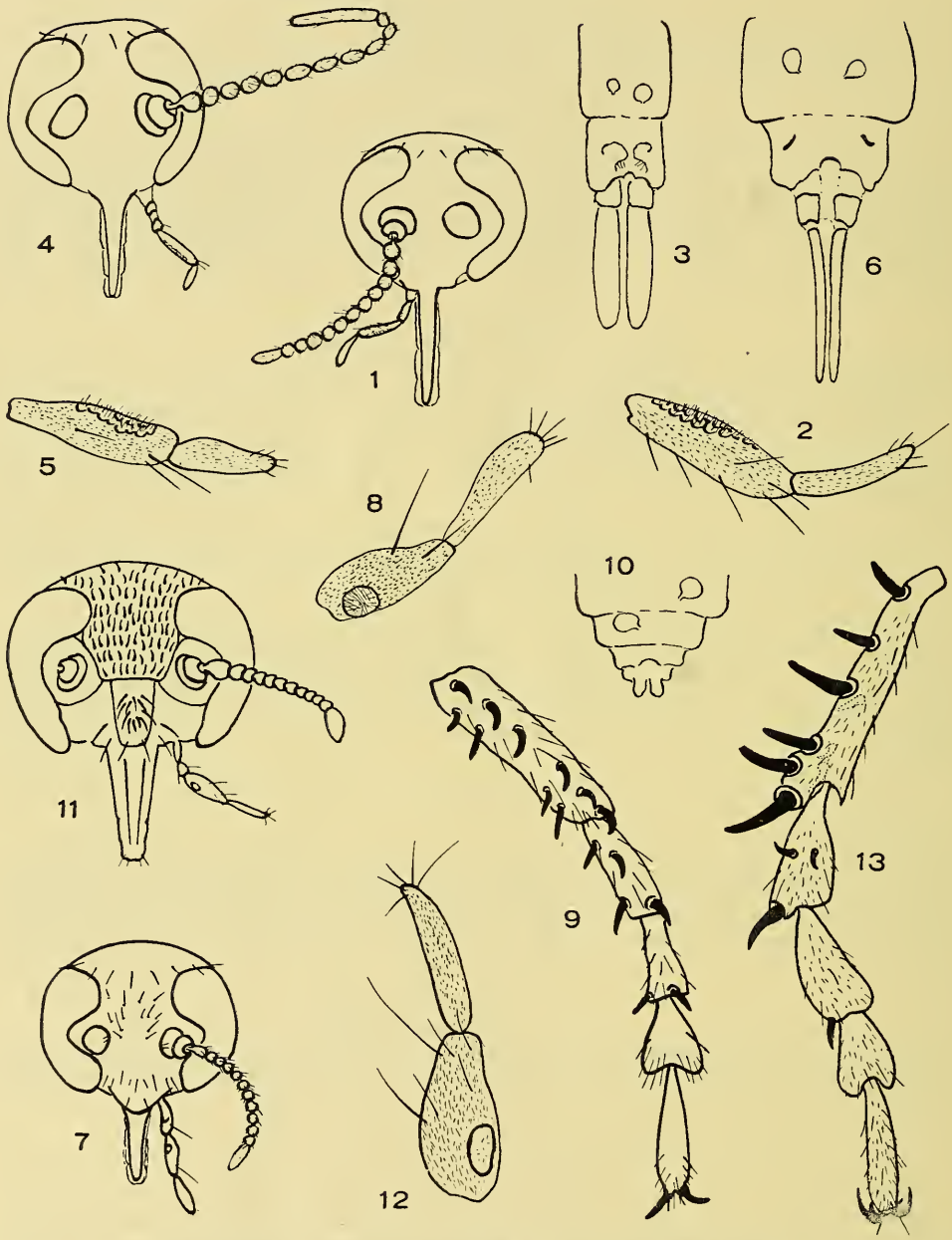
Synonymy: *Acanthoconops myersi*, Tonnoir, loc. cit.

DISTINCTIVE CHARACTERS.

This species is very similar to *S. albiventris* and according to Tonnoir "the only differences are in the scanty hair on the frons, the untoothed tarsal claws, and the length of the hind metatarsi, which is two-thirds that of the tibia instead of one-half".

I have compared a paratype of *S. myersi* with specimens of *S. albiventris* and found that there is no difference in the frons nor in the claws but that the difference in relative length of the hind tibiae and first tarsi does hold. In *S. myersi* the hind tibia is 1·6 × the length of the first tarsal segment and 2·1 × in *S. albiventris*. In addition the femora of *S. myersi* are almost uniformly brown whereas the apical half is considerably darker than the basal half in *S. albiventris*.

There is no doubt the two species are very closely similar and both are serious pests of man where they occur abundantly.



Text-figures 1-13.—Various species of the *Leptoconops* group.

Figs. 1-3.—*Leptoconops stygius*. 1, Anterior view of head. 2, Segments 3 and 4 of palpus. 3, Terminal segments of abdomen.

Figs. 4-6.—*Leptoconops longicornis*. 4, Anterior view of head. 5, Segments 3 and 4 of palpus. 6, Terminal segments of abdomen.

Figs. 7-10.—*Styloconops albiventris*. 7, Anterior view of head. 8, Segments 3 and 4 of palpus. 9, Tarsus of foreleg. 10, Terminal segments of abdomen.

Figs. 11-13.—*Styloconops australiensis*. 11, Anterior view of head. 12, Segments 3 and 4 of palpus. 13, Tarsus of foreleg.

(Magnifications: Figs. 1, 4, 7 and 11 × 64; Figs. 2, 5, 8 and 12 × 236; Figs. 9 and 13. × 250; Figs. 3, 6 and 10, × 66.)

TABLE 1.

Measurements of Leptoconops *Group.*

	Species.						
	L. stygius.	*L. woodhilli.*	*L. longicornis.*	*L. grandis.*	*S. australiensis.*	*S. albiventris.*	*S. myersi.*
	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Body	2·5		(3·5)	(3·5)	2·1	1·6–(1·8)	1·5
Wing	1·47 (Average of 14 specimens)	1·14 (Average of 7 specimens)	(2·2)	(2·0)	1·6	1·05–1·19	1·15
Palpus	0·286	0·182				0·150	
Third segment of palpus ..	0·110	0·065				0·075	
Fourth segment of palpus ..	0·065	0·050				0·080	
Antenna (total)..	(0·48)*–0·52	0·416	(0·84)	(0·62)	0·36	0·380	
Segment 2 ..	0·050 long × 0·065 wide	0·040×0·050				0·045×0·055	
,, 3 ..		0·035×0·035					
,, 4 ..		0·020×0·030					
,, 5 ..		0·025×0·030				0·025×0·033	
,, 6 ..	0·035×0·035	0·025×0·030				0·025×0·033	
,, 12 ..	0·035×0·035	0·030×0·020				0·025×0·028	
,, 13 ..	0·035×0·035	0·030×0·018				0·065×0·030	
,, 14 ..	0·075×0·040	0·070×0·020			0·065	0·070	0·060
Fore leg—							
Femur ..	0·425	0·340			0·391	0·300	0·300
Tibia	0·425	0·306			0·391	0·300	0·325
Tarsus I ..	0·170	0·136			0·153	0·120	0·135
,, II ..	0·085	0·068			0·068	0·060	0·065
,, III ..	0·068	0·068			0·068	0·050	0·060
,, IV ..	0·034	0·026			0·051	0·045	0·040
,, V ..	0·060	0·068			0·068	0·060	0·070
Hind leg—							
Femur ..	0·646	0·391			0·64	0·450	
Tibia	0·476	0·340			0·64	0·375	0·450
Tarsus I ..	0·255	0·187			0·25	0·180	0·435
,, II ..	0·153	0·119			0·15	0·135	0·260
,, III ..	0·085	0·068			0·09	0·075	0·150
,, IV ..	0·026	0·034			0·065	0·045	0·100
,, V ..	0·068	0·065			0·085	0·065	0·050

* Figures in brackets are quoted from other authors.

STYLOCONOPS AUSTRALIENSIS, n. sp.

Types: Holotype ♀ and 2 ♀♀ paratypes in the C.S.I.R. Museum. All specimens mounted on slides.

Type Locality: Pittwater, New South Wales, 14.xii.1946 (D. J. Lee). The specimens were taken biting man.

DISTINCTIVE CHARACTERS.

This is a very dark species except for the almost white abdomen, pale bases to femora, lighter brown tarsi and conspicuously white halteres. The excessively spiny frons immediately distinguishes it from any other Australasian species in the *Leptoconops* group.

DESCRIPTION (Female).

Head: (Text-fig. 11.) The most remarkable feature of the almost black head is the excessively spiny frons similar to that of *S. spinosifrons* (Cart.) from Zanzibar, but apparently even more pronounced. The eyes are very widely separated and the

antennae 14-segmented, segments 4–13 being very short, actually broader than long, with segment 14 expanded and almost four times as long as the preceding segment. The palpi are 4-segmented, of which the first two are small, the second and third considerably longer and subequal, but 3 is also proximally distended with a rounded sensory pit (see Text-fig. 12.)

Thorax: This is very dark brown with creamy-white halteres.

Legs: (See Table I for measurements.) The bases of the femora are lighter brown than the rest of the femora and tibiae; the tarsi are lighter brown. On the forelegs both the first and second tarsal segments carry stout spines (Text-fig. 13). On the mid-legs tarsus I is invested with longer pointed spines and on the hind legs both tarsus I and II are strongly spinose. The claws are equal, each with a prominent tarsal tooth.

Wings: The wing length is 1·6 mm. They are very pale and similar to those of *S. albiventris*.

Abdomen: This is white in living specimens and with the tergites scarcely chitinized. The lamellae of the ovipositor are very short and the spermathecae two in number, rounded, with obvious chitinized ducts.

Distribution: Only known from the type locality.

References: Systematic references are cited in full in the text. Any other general references will be found cited in full in Part I of this series.

EXPLANATION OF PLATE XXI.

Figs. 1-4.—Photographs of wings of various species of the *Leptoconops* group. All × 50.

These photographs are the work of Mr. E. Parrish of the McMaster Laboratory, C.S.I.R. Division of Animal Health, University of Sydney. At the time of writing Mr. Parrish is not available to give details of the photographic methods used, but I hope to include these in a later part. The preparations from which the photographs were made were detached wings mounted in euparal except in the case of *S. albiventris*, for which species it was found necessary to mount in a non-clearing celluloid medium in order to get a satisfactory photograph. No staining was used for the purposes of these photographs.

Fig. 1.—*S. albiventris*, specimen from Aitape.

Fig. 2.—*L. woodhilli*, paratype.

Fig. 3.—*L. stygius*, specimen from Fitzroy Falls.

Fig. 4.—*L. longicornis*, specimen from Crawley, Western Australia.